**9. Circle Class**  
Write a Circle class that has the following member variables:  
**•** radius: a double  
**•** pi: a double initialized with the value 3.14159  
The class should have the following member functions:  
**• Default Constructor.** A default constructor that sets radius to 0.0.  
**• Constructor.** Accepts the radius of the circle as an argument.  
**• setRadius**. A mutator function for the radius variable.  
**• getRadius**. An accessor function for the radius variable.  
**• getArea**. Returns the area of the circle, which is calculated as  
area = pi \* radius \* radius  
**• getDiameter**. Returns the diameter of the circle, which is calculated as  
diameter = radius \* 2  
**• getCircumference**. Returns the circumference of the circle, which is calculated as  
circumference = 2 \* pi \* radius  
Write a program that demonstrates the Circle class by asking the user for the circle’s  
radius, creating a Circle object, and then reporting the circle’s area, diameter, and  
circumference.

**10. Population**  
In a population, the birth rate and death rate are calculated as follows:  
Birth Rate = Number of Births ÷ Population  
Death Rate = Number of Deaths ÷ Population  
For example, in a population of 100,000 that has 8,000 births and 6,000 deaths per  
year, the birth rate and death rate are:  
Birth Rate = 8,000 ÷ 100,000 = 0.08  
Death Rate = 6,000 ÷ 100,000 = 0.06  
  
Design a Population class that stores a population, number of births, and number of  
deaths for a period of time. Member functions should return the birth rate and death  
rate. Implement the class in a program.  
*Input Validation: Do not accept population figures less than 1* , *or birth or death numbers less than 0.*

**14. Freezing and Boiling Points**  
The following table lists the freezing and boiling points of several substances.

|  |  |  |
| --- | --- | --- |
| **Substance** | **Freezing Point** | **Boiling Point** |
| Ethyl Alcohol | –173 | 172 |
| Oxygen | –362 | –306 |
| Water | 32 | 212 |

Design a class that stores a temperature in a temperature member variable and has  
the appropriate accessor and mutator functions. In addition to appropriate constructors, the class should have the following member functions:  
**• isEthylFreezing.** This function should return the bool value true if the temperature stored in the temperature field is at or below the freezing point of ethyl  
alcohol. Otherwise, the function should return false.  
**• isEthylBoiling.** This function should return the bool value true if the temperature stored in the temperature field is at or above the boiling point of ethyl  
alcohol. Otherwise, the function should return false.  
**• isOxygenFreezing.** This function should return the bool value true if the temperature stored in the temperature field is at or below the freezing point of oxygen. Otherwise, the function should return false.  
**• isOxygenBoiling.** This function should return the bool value true if the temperature stored in the temperature field is at or above the boiling point of oxygen. Otherwise, the function should return false.  
**• isWaterFreezing.** This function should return the bool value true if the temperature stored in the temperature field is at or below the freezing point of  
water. Otherwise, the function should return false.  
**• isWaterBoiling.** This function should return the bool value true if the temperature stored in the temperature field is at or above the boiling point of water.  
Otherwise, the function should return false.  
Write a program that demonstrates the class. The program should ask the user to  
enter a temperature, and then display a list of the substances that will freeze at that  
temperature and those that will boil at that temperature. For example, if the temperature is -20 the class should report that water will freeze and oxygen will boil at that  
temperature.